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## RETAINING ELEMENT FOR BUILDING SHEETS

The present invention relates to an elongate retaining element for building sheets having as seen in cross section perpendicular to its direction of elongation, a head part for engaging at least one building sheet. The invention further relates to an assembly  
5 such a elongate retaining element engaging at least one building sheet member.

Such an elongate retaining element is known from GB-2167101-A, which discloses a retaining element having a head part and a base part connected by a connecting flange. The head part engages with the free end of at least one building  
10 sheet, which is at least partially curved over the head part of the retaining element. The head part is substantially triangular in cross section and has rounded vertices that engage with the building sheet.

A disadvantage of such prior art retaining elements is that movement of the building sheets over the retaining element, caused by e.g. thermal expansion or wind  
15 suction, generates unpleasant noise.

One proposed solution to the problem of noise is proposed in GB-342933-A in which the head part of the retaining element is provided with a solid coating comprising an organic powder coating.

Another proposed solution is known from DE-4217221-A1 disclosing a holding  
20 element for use in roof constructions. The holding element is formed by a folded sheet with a curved end-section forming a head part. The head part co-operates via ball bearings or tapered wheels with a separate member extending across the direction of elongation of the holding element. The building sheet member is flanged over this separate member.

25 An object of the present invention is to provide an improved retaining element. A further preferred object of the present invention is to provide a retaining element that reduces the noise generated when building sheets when sliding in use over the head part of the retaining element.

One or both of these objects are obtained by a retaining element having in plane  
30 or as seen in cross section perpendicular to its direction of elongation, a head part which is substantially triangular in cross section, said head part comprising one or more movable rotationally symmetrical elements, said elements being positioned at one or more vertices of the triangle, and characterised in that said head part comprises one or more mountings in which the elements for engaging in use the building sheet  
35 are mounted and in that the mountings are attached to the head part by fixing means.

The movable elements allow the engageable building sheet to slide over the head part. The presence of movable elements in the head part significantly reduces

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the friction between the head part and the engageable building sheet enabling the building sheet to slide easily over the head part of the retaining element without generating significant noise. Wearing of the building sheet and the head part of the retaining element and resultant dust formation is also reduced. A further advantage is that reduced friction between the head part and the building sheet reduces the mechanical load on the joint with a support structure. A high mechanical load on the retaining element is particularly undesirable where the support structure to which a retaining element is attached is less robust such as for example, insulating glass wool or foam glass. By reducing the mechanical loading to which the retaining element is subjected the present invention reduces the risk of the retaining element failing. The movable elements are rotatable to facilitate the sliding of a building sheet over the head part. The movable elements are preferably rotationally symmetrical and can freely and smoothly rotate reducing the chance of noise generation as a building sheet slides over the head part of the retaining element. The head part comprises one or more mountings in which one or more movable elements are mounted. The mountings preferably extend in the direction of elongation of the retaining element. Of course the head part may comprise more than one mounting and each mounting may contain multiple movable elements. The mountings facilitate assembly of a retaining element, as the movable elements do not have to be individually mounted to the retaining element.

The head part of the retaining element is substantially triangular in cross section and has a movable element positioned at one or more vertices of the triangle. The movable elements are therefore positioned on the head part at the points where a building sheet contacts the head part and are thus optimally positioned to reduce the friction between the head part and a building sheet sliding over the head part.

In an embodiment the movable elements are preferably spherical and can thus rotate in all orientations further reducing the chance of noise generation. The spherical movable elements preferably have a diameter in a range of 1mm to 10mm to ensure that they can be easily mounted on the head part and effectively facilitate in use the sliding of a building sheet over the head part of the retaining element.

In an embodiment the movable elements are preferably made from metal, plastic or ceramic or a combination of these. Metal and ceramic are both hard and resistant to wearing offering good durability whilst plastic such as PTFE (polytetrafluoroethylene) is easily formable and resistant to temperature variations. The metal used is more preferably sinter metal e.g. sinter bronze for increased hardness and wear resistance.

In an embodiment the retaining element preferably comprises a base part and a connecting flange connecting the base part and the head part wherein the head part, excluding the mountings and movable elements, the base part and connecting flange are made from metal which can be extrusion formed or a combination of metal and plastic which provides an insulating barrier between the interior of a roofing or cladding assembly and the building sheets for example as known from EP-1236840-A1 (incorporated herein by reference). The head part, excluding the mountings and movable elements, the base part and connecting flange are preferably formed from extruded aluminium.

The retaining element known from international application WO-98/53158 (incorporated herein by reference) may be provided with a head part as proposed in the present invention.

A further aspect of the invention relates to an assembly for roofing a building or cladding e.g. the façade of a building comprising one or more elongate retaining elements as described above whereby the free end of at least one building sheet is flanged over the head part of the elongate retaining element engaging one or more of the movable rotationally symmetrical elements, and having the advantages as set out above.

A further aspect of the invention relates to a mounting, in which movable elements are mountable, for use in the elongate retaining element according to the present invention.

The present invention is described further by way of example with reference to the accompanying schematic drawings in which:

Fig.1 shows a cross section perpendicular to the direction of elongation through a retaining element according to the invention;

Fig. 2 shows a side view of a retaining element according to the invention;

Fig. 3 shows a retaining element according to the invention engaging with building sheets;

Fig. 4 shows a further retaining element according to the invention engaging with building sheets;

Fig. 5A to 5C show a further retaining element according to the invention in three different directions;

Fig. 6 show a mounting for holding bearings as used in the retaining element of Fig. 5;

5 Fig. 1 shows a retaining element comprising a head part 1, a connecting flange 2 and a base part 3 where the connecting flange 2 connects the base part 3 to the head part 1. The head part 1 of the retaining element is preferably substantially triangular and comprises mountings 5 into which movable elements 4 in the form of ball bearings are mounted. The movable elements could also be for example cylindrical or rugby-  
10 ball shaped. The movable elements may be made from metal, in particular sinter metal such as sinter bronze, plastic or ceramic. The mountings 5 may be attached by snap-fitting or a lock nut or may be fixed with adhesive or other fixing means. The mountings may be made of plastic which provides an insulation layer between the building sheets and the connecting flange and base parts of the retaining element and also resiliently  
15 retains the movable elements. The mountings may also be made from metal for durability. The head part of the retaining element, excluding the mountings and movable elements, the connecting flange and base parts of the retaining element are preferably made from metal or a combination of metal and plastic. The head part of the retaining element, excluding the mountings and movable elements, the connecting  
20 flange and base parts of the retaining element are preferably made from extruded aluminium.

Fig. 2 shows a side view of a retaining element according to the invention. The numbering is in accordance with Fig. 1 as described above. It can be seen that the mountings 5 in which the movable elements 4 are mounted preferably extend in the  
25 direction of elongation of the retaining element.

Fig. 3 shows a retaining element according to the invention and numbered in accordance with Fig. 1 as described above. The head part of the retaining element is substantially triangular in cross section. The retaining element is engaging with building sheets 6 and 7. Building sheets 6 and 7 have upstanding flanges 6a and 7a  
30 respectively, which end in curved portions 6b and 7b that curve around head portion 1 of the retaining element. The base part of the retaining element is mounted on a support structure 8 which can be for example a roof girder.

Fig. 4 shows a retaining element according to the invention and numbered in accordance with figures 1 and 3 as described above. The head part of the retaining  
35 element is substantially triangular in cross section and comprises cut away portions 10,11 adjacent the connecting flange 2 which form grooves extending along the

direction of elongation of the retaining element. The retaining element is engaging with building sheets 6 and 7 which have upstanding flanges 6a and 7a respectively. The upstanding flanges end in curved portions 6b and 7b that curve around head portion 1 of the retaining element. The curved portions 6b and 7b of the building sheets can  
5 extend into the cut-away portions or grooves 10 and 11 which improve the engagement of the head part with the building sheets. The base part of the retaining element is mounted on a support structure 8 which can be for example a roof girder.

The retaining elements can of course also be mounted horizontally for example as part of a wall cladding or façade assembly for a building, or at other angles from the  
10 vertical.

Fig. 5A shows another embodiment of the retaining element according to the invention as seen in the direction of elongation. In the head part 1 a mounting or holder is provided holding movable elements 4, preferably bearings and more preferably ball bearings, each bearing is located at the vertices of a triangle. The mounting or holder  
15 is preferably made of one single element, see Fig. 6. Fig. 5C shows a top view of the retaining element of Fig. 5A, in which there are providing three mountings each having three ball bearings 4. The mountings (not shown) are preferably arranged at regular intervals. In this embodiment three mountings are shown, but it will be apparent to the skilled person that the retaining element should have one or more of such mountings  
20 with bearings, e.g. one, two, three, four, or more of the mountings could be inserted into the head part 1 of the retaining element. Each mounting with the bearings is located in the head part of the retaining element and is arranged in grooves or slots in the head part of the retaining element. Such grooves are preferably substantially perpendicular to the direction of elongation of the retaining element. Where the  
25 retaining element is made from an extrusion, the grooves are preferably cut or machined into the head part of the retaining element. The mountings are preferably coupled to the retaining element to prevent sliding out in service from the head part. Such a coupling could be achieved using locking means 11, for example a lock nut, applied through the head part of the retaining element. Fig. 5B shows a side view of  
30 the retaining element of Fig. 5A.

Fig. 6 shows schematically a mounting 12 or holder which can be used in the retaining element of Fig. 5. The bearings are fitted into the mounting in recesses at the vertices. Preferably there is provided a central bore for accommodating a lock for coupling the mounting in the head part of the retaining element. Such a mounting 12  
35 is preferably made from a metal such as an extruded aluminium alloy or from a plastic material, although other suitable materials may be used.

Having now fully described the invention, it will be apparent to one of ordinary skill in the art that many changes and modifications can be made without departing from the spirit or scope of the invention as hereon described.